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Virtual Geostationary Monitoring of the Northern Hemisphere

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Surface and atmospheric processes in the Northern Hemisphere deeply impact commerce, quality of life, health, and safety of most of the world's population. Equatorial geostationary satellites now add crucial short-timescale information on the physical state and dynamics of the Earth's surface, atmosphere, and resulting environmental hazards (e.g., explosive volcanic eruptions, ozone distributions, severe storm observations) occurring below ±60° latitude. A new "virtual polar-geostationary satellite" concept, utilizing a constellation of small satellites in Molniya (i.e., highly elliptical, high-inclination) orbits with complementary (phased) viewing geometries, would provide 24hrs/day continuous coverage of the Northern Hemisphere (above about 40°Nlat)--permitting geostationary-style observations at polar and sub-polar latitudes, much like suspending a geostationary satellite over the North Pole. Of particular interest would be (a) the prompt detection of explosive volcanic eruptions [utilizing very rapid (<1minute/image) sampling algorithms] and tracking of eruption products (e.g., ash and SO_2 plumes), re: airline safety issues related to busy sub- and trans-polar routes; (b) real-time monitoring of wildfires (e.g., Alaska, Scandinavia, and Siberia); (c) real-time monitoring of springtime riverine and estuarine ice-breakouts, important for oil exploration/production logistics (e.g., North Slope, Siberia); (d) monitoring diurnal variability in natural vegetation, with emphasis on detection of water stress in managed ecosystems; (e) monitoring of stratospheric ozone destruction at high spatial resolution (1-10km/pixel), monitoring of the evolution of related transient polar stratospheric clouds, and observations of other hazards-related trace gas constituents; (f) unprecedented high-time-frequency monitoring of the wind fields of polar tropospheric cloud systems. Work here supported, in part, under NASA contract at JPL.

Suggested Session or Topic:
Geologic Hazards/Disaster Management

Author's Comments:
"I think this abstract is just one example of a growing interest in high time resolution observations of surface processes, often in coupled surface-atmospheric systems, and particularly in the area of geologic or environmental hazards. For geologists, the study of such processes often overlaps into the atmospheric science area (e.g., volcanic processes), and thus demands a multi-disciplinary approach. I think this group (and this project) well represents such a collaboration, and may not be a bad model of how to approach global environmental hazards-related problems that are so much on everyone's minds these days."